QUALITY ASSURANCE OF INSTRUCTORS IN TEACHING ELECTRONICS MAINTENANCE AND REPAIR TO STUDENTS IN POLYTECHNICS IN SOUTHWEST, NIGERIA

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Abstract

The study was carried out to determine quality assurance of instructors in teaching electronics maintenance and repair to students in polytechnics in southwest zone of Nigeria. Five research questions guided the study. Survey research design was used for the study. The population for the study was 100 instructors from ten government established polytechnics in southwest zone of Nigeria. There was no sample because of the small size of the population. Psycho productive multiple choice test item and structured competency cluster item questionnaire were used for data collection. The two set of instrument were validated by four experts. Split half technique, cronbach alpha and product moment correlation coefficient were used to determine the reliability of the two sets of instruments with a coefficient of 0.85 for the structured questionnaire item and 0.81 for the psycho productive multiple choice test item. Forty copies of each of the two sets of instrument were administered to the respondents by the researchers on one to one basis. All the forty copies of each set of the instrument were retrieved and analyzed using frequency, percentage, mean and improvement needed index (INI) to answer the research questions. It was found out that the quality assurance of the instructors in teaching electronics maintenance and repair was average. The study also found out that the instructors required improvement on teaching maintenance and repair of radio set, compact disc/ video compact disc and digital video disc players, television sets and cell phones to students of polytechnics in southwest zone of Nigeria.

Introduction

Electronic maintenance and repair is an important course which every student in electronic engineering technology in polytechnics must offer before graduation. It is an essential course in the curriculum of Higher National Diploma (HND) in electronic engineering technology in Nigeria. Electronics engineering technology according to Collegeboard (2008) is

the application of scientific knowledge in the design, selection of materials, construction, operation and maintenance of electronics. Electronic maintenance and repair is a course designed to expose students to practical works such as maintenance and repair of electronic equipment like radio, television set, cell phones, cassette players, compact disc players and video players. It is also involves the testing and troubleshooting of faulty electronic appliances with electronic measuring instruments such as ammeter, voltmeter, ohmmeter, AVO meter, multimeter and oscilloscopes. According to Olaleye (2001) electronic maintenance and repair exposes students to electronic maintenance and repair skills. Students offering electronic maintenance and repair are expected to acquire repair and maintenance skills before graduation. Maintenance according to Olaitan in Ihediwah (2007) is a set of measure or steps taken to ensure that a given piece of equipment or infrastructure is kept in good operational order until it attain its maximum possible life span.

According to the report of National Board for Technical Education (NBTE), (2002) electronic maintenance and repair was incorporated into the curriculum of electronic engineering technology in order to facilitate the attainment of the objective on maintenance and repair of electronic equipment. Conrad in Bukar (2006) described electronic maintenance and repair as a course meant for teaching students the necessary skills for finding faults in electronic equipment and figuring out how to put back such equipment into working condition. The report of NBTE (2002) identified competences in the following modules to be taught to HND students in the course in Nigerian polytechnics:

- Uses of various electrical and electronic measuring instrument
- Diagnosis and rectify of faults in electronic equipment
- Alignment in electronic equipment

A polytechnic in Nigeria is a tertiary institution that exposes students to practical skills for employment in a specific occupation. According to the report of NBTE (2003) a polytechnic or college of technology is a tertiary institution offering varieties of technological/business diploma programmes at National Diploma, Higher National Diploma and Post Higher National Diploma levels that qualify holders for registration in their professional field. In the polytechnics in Nigeria, electronic maintenance and repair is taught by instructors in the workshops.

Instructors are individuals that are qualified to teach practical skills to students. They are usually empowered with knowledge and skills in electronic maintenance and repair. These instructors are charged with the responsibilities of training students on how to maintain and repair electronic equipment such as radio and television sets, cell phones and compact disc, video compact disc and /digital video disc players with the aids of electronic measuring instruments. The contributions of these instructors are very essential to the quality of students of electronic engineering technology in the polytechnics because these students on graduation could neither employ themselves nor be employed by any relevant industries. Egbita (2006) said that graduates (electrical/electronic inclusive) of the polytechnics always shy away from taking up employment where they might be called upon to demonstrate their skills. It is also observed that they could not establish their own workshops after graduation probably because of their in competencies in maintenance and repair of electronic equipment. The society continues to lack competent personnel to maintain and repair their faulty electronic equipment that litter the environment. These electronic equipment according to Siegel (2006) contained radioactive material which can cause health problem such as cancer to the people especially where they are exposed carelessly.

In the study area, the owners of faulty electronic equipment used to blame incompetent graduates of electronic maintenance and repair for incompetence in identifying faults and correcting them. It is assumed that the incompetence of graduates of electronic maintenance and repair is based on the quality of instruction received while in training which normally associated with the instructors; but there is no empirical evidence to support this assumption neither there is any empirical evidence to exonerate the instructors from the blame on their graduates. Therefore, it is necessary to determine the quality assurance of instructors in teaching electronic maintenance and repair to students in the polytechnics.

Quality assurance in the view of Pearson (2007) is the practice of checking the quality of goods and services rendered by an individual or company so that the standard will continue to be good. In the context of this study, quality assurance is the determination of the competence of the instructors in teaching electronic maintenance and repair to HND students to enable them be employable in the society. The purpose of this study therefore, is to determine the quality assurance of

the instructors in teaching electronics maintenance and repair to students in polytechnics in southwest zone of Nigeria. Specifically, the study sought to determine:

(1) Quality assurances of instructors in teaching electronics maintenance and repair to students in polytechnics in southwest zone of Nigeria
(2) Quality assurance of instructors in maintenance and repair of radio set.
(3) Quality assurance of instructors in maintenance and repair of compact disc, video compact disc and digital video disc players
(4) Quality assurance of instructors in maintenance and repair of television sets
(5) Quality assurance of instructors in maintenance and repair of cell phones with areas where improvements are needed in teaching by instructors.

Research Questions

The following research questions guided the study

(1) What are the quality assurances of instructors in teaching electronics maintenance and repair to students in polytechnics in southwest zone of Nigeria?
(2) What are the quality assurance of instructors in maintenance and repair of radio set?
(3) What are the quality assurance of instructors in maintenance and repair of compact disc, video compact disc and digital video disc players?
(4) What are the quality assurance of instructors in maintenance and repair of television sets?
(5) What are the quality assurance of instructors in maintenance and repair of cell phones?

Method

Five research questions were developed to guide the study. Survey research design was adopted for the study. Survey research design according to Ali (2006) is the one in which a group is studied by collecting and analyzing data from a sample considered representative of the population or the entire population when not too large to be managed and comparing what is obtained with the predetermined standards.

The study was carried out in ten government established polytechnics in the southwest zone. The population for the study was 100

instructors in the department of electrical /electronic engineering technology from 10 polytechnics. Two sets of instrument were developed for the study; they were 36 psycho- productive multiple choice test item in electronic maintenance and repair for determining quality assurance of instructors and 40 competency cluster structured questionnaire item for identifying areas where instructors require improvement. The questionnaire was divided into two categories of needed and performance. The needed category has a 4 point response scale of Highly Needed, Average Needed, Slightly Needed and Not Needed; while the performance category also has 4 point response scale of High performance, Average performance, Low performance and No performance with a corresponding value of 4, 3, 2 and 1 for the two groups of scale respectively. Two set of instruments were validated by five experts; two from Department of Electronics Engineering while other three from Department of Vocational Teacher Education all from University of Nigeria, Nsukka. Split half technique and cronbach alpha reliability method were used to determine the internal consistency of the questionnaire items with a cronbach alpha coefficient of 0.85. Product moment correlation coefficient was adopted to obtain the stability of the psycho-productive multiple choice test items and a coefficient of 0.81 was obtained.

100 copies of the 36 psycho-productive multiple choice test items were administered to the instructors on one to one basis with 45 minutes duration for providing answer to the multiple choice items. This was carried out personally by the researchers in the polytechnics involved. Three weeks later, 100 copies of the 40 – competency cluster item questionnaire were administered on the same instructors in the polytechnics with a three day interval for the completion of the questionnaire. Three trained research assistants who are conversant with the area of the study were hired for the questionnaire administration. The entire forty copies of questionnaire administered were retrieved and analyzed. Frequency and percentage were used to analyze data from the psycho productive multiple choice items to determine the quality assurance of the instructors; while improvement need index (INI) was employed to analyze data from the competency cluster questionnaire items in order to identify areas where instructors require improvement in teaching electronic maintenance and repair to students. In taking decision on the level of quality assurance and

competence of the instructors, the following percentage ranges were used; 70% and above = Very High Competence; 60 – 69% = High Competence; 50 – 59% = Average Competence; 40 – 49% = Low Competence; and below 40% = No Competence.

Improvement needed index (INI) was used for taking decision on areas where improvement is required by instructors in teaching electronic maintenance and repair to students in the polytechnics in southwest zone of Nigeria. The improvement needed index was determined as follows;

(i) The mean (Xn) of the needed category was determined for each item

(ii) The mean (Xp) of the performance category was also determined for each item

(iii) The performance gap (PG) was therefore determined by finding the difference between Xn and Xp for each item; that is PG = Xn – Xp.

Where the value of PG is zero (0), it means improvement is not needed. This only indicated that the level at which the instructors were performing the teaching of the items is equal to the level that was required. Where PG is negative (-), it means improvement not needed because the instructors are performing the teaching of the item more than what is required. But where the value of PG is positive (+) improvement is needed. That is, the level at which the instructors were performing in teaching the items to students is lower than what is required

Results

The results for the study were obtained from the research questions answered through data collected and analyzed.

Research Question I

What are the quality assurances of instructors in teaching electronics maintenance and repair to students in polytechnics in southwest zone of Nigeria?

The data for answering research questions I are presented in table I below

Table 1

Percentage Scores of Instructors on the Actual Competences in Teaching Electronics Maintenance and Repair to Students in Polytechnics in the Southwest Zone of Nigeria.

S/N	Cluster Items	Frequency	Percentage (%)	Remarks
1.	Maintenance of radio sets	60	60	High competence
2.	Repair of radio sets	46	46	Low competence
3.	Maintenance of CD/VCD/DVD players	51	51	Average comp.
4.	Repair of CD/VCD/DVD players	48	48	Low competence
5.	Maintenance of television set	56	56	Average comp.
6.	Repair of television set	40	40	Low competence
7.	Maintenance of cell phones	61	61	High competence
8.	Repair of cell phones	41	41	Low competence

The table 1 revealed that the actual scores of the instructors on their level of competencies in teaching electronics maintenance and repair to students in polytechnics in southwest zone of Nigeria ranged from 40 to 61%. The table revealed further that the instructors had high competence in teaching maintenance of radio (60%) and maintenance of cell phones (61%). The instructors were average in competence in maintenance of television set (56%) and maintenance of CD/VCD/DVD players (51%); they have low competence in teaching repair of radio set (46%), repair of CD/VCD/DVD players (48%) and repair of television set (40%) as revealed by the table. The overall average of the percentage scores of the instructors in the eight areas of electronics maintenance and repair as in table 1 above is 50.4%. Based on these findings, the quality assurance (level of competence) of the instructors in teaching electronics maintenance and repair to students in polytechnics in southwest zone of Nigeria was average.

Research Question 2

What are the competence in maintenance and repair of radio where instructors in polytechnics needed improvement in teaching the students?

The data answering research question 2 are presented in table 2

Table 2

Performance Gap Analysis of the Mean rating of the perceived Competencies of the Instructors in teaching Maintenance and Repair of Radio to Students in Polytechnics in Southwest Zone of Nigeria.

S/N	Item Statements	Xn	Xp	(Xn – Xp)	Rmk
	(Radio Receivers)				
1.	Select appropriate tools and materials	3.43	3.62	- 0.19	INN
2.	Clean the volume control	3.42	3.52	- 0.10	INN
3.	Test the mains lead for functionality	3.77	2.51	1.26	IN
4.	Unscrew and dismantle radio set	3.75	2.03	1.72	"
5.	Test the battery with multimeter	3.62	1.98	1.64	"
6.	Test the transformer with multimeter	3.98	1.80	2.18	"
7.	Identify stages in a radio set	3.79	1.88	1.91	"
8.	Identify faulty components with multimeter	3.97	1.88	2.09	"
9.	Adjust Arial coil for reception	3.22	2.56	0.66	"
10.	Adjust intermediate frequency	3.12	2.76	0.36	"
11.	Service radio selection band	3.34	2.45	0.89	"
12.	Fix radio driving cord	3.54	2.11	1.43	"
13	Remove faulty components the circuit	3.88	2.01	1.87	"
14	Insert good components on the board	3.85	1.54	2.31	"
15	Solder components correctly	3.98	168	2.30	"
15	Couple back the radio	3.88	1.98	1.90	"
16	Test the radio set for functionality	3.31	2.98	0.33	"
	(Radio tape/ tape recorder/cassette players)				
17	Service the mechanism	3.89	1.78	2.11	"
18	Maintain recording switch	3.56	2.55	1.01	"
19	Trace faults with multimeter	3.79	2.09	1.69	"
20	Fix and solder play head correctly	3.34	2.42	0.92	"
21	Replace pitch roller on the mechanism	3.35	2.38	0.97	"
22	Replace malfunctioned d.c motor	3.56	2.79	0.77	"

Key: Xn = Mean of Needed
Xp = Mean of Performance
PG = Performance Gap
IN = Improvement Needed
INN = Improvement Not Needed
Number of Respondents

Table 2 showed that the performance Gap (PG) of the instructors for twenty (20) out of twenty two (22) competency items ranged from 0.33 to 2.31 and are positive. This indicated that the

instructors needed improvement in the 20 items. The performance gap value for item 1 and 2 are negative (-0.19 and – 0.10); indicating that the instructors do not need improvement in teaching the items.

Generally, this result revealed that instructors in polytechnics in southwest zone of Nigeria needed improvement in teaching maintenance and repair of radio set to students.

Research Question 3

What are the competencies in maintenance and repair of compact disc, video compact disc and digital video disc players where instructors in polytechnics needed improvement in teaching the students?

The data for answering research question 3 are presented in table 3.

Table 3

Performance Gap Analysis of the Mean Ratings of the perceived Competencies of the Instructors in teaching Maintenance and Repair of CD/VCD/DVD Players to Students in Polytechnics in Southwest Zone of Nigeria.

S/N	Item Statements	Xn	XP	Xn -Xp	Remark
1.	Select tools for maintenance and repair	3.11	3.99	-0.86	INN
2.	Unscrew the casing of CD/VCD/DVD	3.51	3.60	-0.09	INN
3.	Cleaning of CD/VCD lens	3.51	2.48	1.03	IN
4.	Test mains lead for functionality	3.62	3.51	0.11	"
5.	Identify CD/VCDDVD power pack	3.77	2.11	1.66	"
6.	Identify stages in CD/VCD player	3.71	1.69	2.03	"
7.	Remove bad universal serial bus	3.52	2.12	1.40	"
8.	Remove malfunction picture board	3.46	2.61	0.85	"
9.	Identify and remove bad conax panel	3.57	2.45	1.12	"
10.	Replace bad signal board	3.63	2.78	0.85	"
11.	Identify and remove bad AV panel	3.48	2.89	0.59	"
12.	Remove malfunction RF panel	3.72	2.69	1.03	"
13.	Test power pack components with multimeter	3.55	2.78	1.66	"
14.	Identify malfunctioned components	3.91	1.98	1.93	"
15.	Test the components	3.81	1.23	2.58	"
16.	Remove bad components from the board	3.79	1.11	2.68	"

17. Replace bad components with good ones	3.69	1.48	2.21	"
18. Insert components into the board	3.71	2.00	1.71	"
19. Solder components correctly	3.56	1.49	2.07	"
20. Couple repaired and maintained	3.98	1.77	2.21	"
21. Test CD/VCD/DVD for functionality	3.52	2.99	0.53	"

Key: Xn = Mean of Needed — IN = Improvement Needed
Xp = Mean of Performance — INN = Improvement Not Needed
PG = Performance Gap — Number of Respondents

Table 3 showed that the performance Gap (PG) of the instructors for nineteen (19) out of twenty one (21) competency items ranged from 0.11 to 2.68 and are positive. This indicated that the instructors needed improvement in the 13 items. The performance gap value for item 1 and 2 are negative (-0.86 and – 0.09 respectively); indicating that the instructors do not need improvement in teaching the items.

Research Question 4

What are the competencies in maintenance and repair of television set where instructors in polytechnics needed improvement in teaching the students?

The data answering research question 4 are presented in table 4

Table 4

Performance Gap Analysis of the Mean Ratings of the perceived Competencies of the Instructors in Teaching Maintenance and Repair of Television sets to Students in Polytechnics in Southwest Zone of Nigeria.

S/N	Item Statements	Xn	Xp	(Xn – Xp)	Remarks
	(Black and White TV)				
1.	Select appropriate tools for servicing	3.11	3.52	-0.11	INN
2.	Select good place for repair	3.38	3.68	-0.30	"
3.	Remove casing of the TV set	3.59	3.21	0.38	IN
4.	Set the horizontal & vertical holding	3.78	3.61	0.17	"
5.	Identify stages in the TV set	3.89	1.79	2.10	"
6.	Trace faults with multimeter	3.21	2.42	0.80	"
7.	Identify and replace line transformer	3.32	2.11	1.21	"
8.	Replace good choke with bad one	3.45	2.02	1.43	

9. Remove and install picture tube	3.82	1.11	2.71	"
10. Carry out tests on the transformer	3.79	1.78	2.01	"
11. Identify faulty components	3.59	1.81	1.78	"
12. Remove faulty components	3.68	1.12	2.56	"
13. Test and replace fuses for functionality	3.41	2.78	0.63	"
14. Test the components with multimeter	3.71	2.00	1.71	"
15. Fix the good components on board	3.71	1.22	2.49	"
16. Solder components correctly	3.58	2.35	1.23	"
17. Couple the TV set	3.56	2.44	1.12	"
Colour Television				
18. Remove croma integrated circuit	3.41	2.56	0.85	"
19. Test AV panel for functionality	3.65	2.23	1.42	"
20. Test RF panel for functionality	3.53	2.34	1.19	"
21. Remove faulty navigating keys	3.29	2.60	0.69	"
22. Diagnose faults in control panel	3.44	1.99	1.45	"
23. Detect faults in power pack	3.51	1.98	1.53	"

Key: Xn = Mean of Needed
Xp = Mean of Performance
PG = Performance Gap
IN = Improvement Needed
INN = Improvement Not Needed
Number of Respondents

Table 4 showed that the performance Gap (PG) of the instructors for twenty one (21) out of twenty three (23) competency items ranged from 0.17 to 2.71 and is positive. This indicated that the instructors needed improvement in the 21 items. The performance gap value for item 1 and 2 are negative (-0.11and – 0.30 respectively); indicating that the instructors do not need improvement in teaching the items.

Research Question 5

What are the competencies in maintenance and repair of cell phones where instructors in polytechnics needed improvement in teaching the students?

The data answering research question 5 are presented in table 5

Table 5
Performance Gap Analysis of the Mean Ratings of the perceived Competencies of the Instructors in Teaching Maintenance and Repair of Cell phones to Students in Polytechnics in Southwest Zone of Nigeria.

S/N	Item Statements	Xn	Xp	Xn – Xp	Remarks
1.	Dismantle the cell phone	3.78	2.89	0.89	IN
2.	Remove the battery	3.69	3.78	- 0.09	INN
3.	Clean the cell phone	3.67	3.89	- 0.22	"
4.	Test the battery with multimeter	3.75	2.99	0.76	IN
5.	Check the screen	3.89	1.78	2.11	"
6.	Test the charging point	3.11	3.09	0.02	"
7.	Flash the phone	3.01	2.98	0.03	"
8.	Install software on the phone	3.59	2.05	1.54	"
9.	Configure the phone	3.85	1.11	2.74	"
10.	Couple the cell phone	3.98	2.01	1.97	"

Key: Xn = Mean of Needed — IN = Improvement Needed
Xp = Mean of Performance — INN = Improvement Not Needed
PG = Performance Gap — Number of Respondents

Table 5 showed that the performance Gap (PG) of the instructors for eight (8) out of ten (10) competency items ranged from 0.02 to 2.74 and are positive. This indicated that the instructors needed improvement in the 8 items. The performance gap value for item 1 and 2 are negative (-0.09 and - 0.22 respectively); indicating that the instructors do not need improvement in teaching the items.

Discussion of Result

The results of this study revealed that the quality assurance of instructors in the polytechnics in southwest zone of Nigeria was average; and the instructors needed improvement in teaching the following competency areas in electronic maintenance and repair of radio, compact disc, video compact disc and digital video disc players, television set and cell phones. These findings agreed with the findings of Olaitan and Ede (2007) who in a study carried out on technical skills improvement needs of auto mechanic teachers for improving teaching of maintenance of automobile in technical colleges of Enugu state. The authors found out that the teachers needed technical

skills for teaching maintenance of modern automobiles. The results of this study was also in agreement with the finding of Ebaye (2007) who in a study carried out on competency improvement needs of automobile mechanics teachers in technical colleges in Cross river and Akwa Ibom states, Nigeria. The author found out that the teachers needed improvement in knowledge of subject matter, use of instructional methods, communication skills, laboratory and classroom management and evaluation.

The results of this study was also in agreement with the findings of a study conducted by Labrecque (2009) on professional improvement needs of administrators of post secondary technical vocational programmes where he found out that administrators required improvement in all the 133 competency task statements in the questionnaire on programme planning, development and evaluation. The findings of the researchers cited above had further improved the reliability of the results of the study.

Conclusion

High rate of unemployment has been observed among the graduates of electronics engineering technology from the polytechnics in the southwest zone of Nigeria due to their low quality of skills acquired from schools. These graduates could not establish their own workshops after graduation probably because of their in competencies in maintenance and repair of electronic equipment belong to the member of the society. The perceived low competence of instructors of electronics maintenance and repair in the polytechnics seemed to be responsible for this trend. These instructors appeared not to have been teaching the needed skills in electronics maintenance very well. The study has assessed the quality assurance of instructors and identified where they needed improvement for effective teaching of electronics maintenance and repair to students in the polytechnics in southwest zone of Nigeria.

It is therefore recommended that the identified competencies should be packaged and used to retrain the instructors of electronics maintenance and repair in order to improve quality of students.

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